

ARMED FORCES RADIOBIOLOGY RESEARCH INSTITUTE

DEFENSE NUCLEAR AGENCY  
Bethesda, Maryland 20014

Tuesday, 22 November 1977

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DEFENSE NUCLEAR AGENCY  
BETHESDA, MARYLAND

SUBJECT: Minutes of the Twenty-Sixth Meeting, Armed Forces Radiobiology  
Research Institute Board of Governors, 22 November 1977

The Board of Governors

VADM R. R. Monroe, USN	Director, Defense Nuclear Agency and Chairman, Board of Governors
LtGen G. E. Schafer, USAF, MC	Surgeon General, U.S. Air Force
VADM W. P. Arentzen, MC, USN	Surgeon General, U.S. Navy
LTG C. C. Pixley, MC, USA	Surgeon General, U.S. Army

Guests

Dr. J. P. Sanford	Dean of the Medical School, Uniformed Services University of the Health Sciences
Mr. Peter H. Haas	Deputy Director for Science and Technology, Defense Nuclear Agency

AFRRI Attendees

Colonel D. W. McIndoe, USAF, MC	Director
LtCol E. T. Still, USAF, VC	Research Program Coordinator
LTC J. T. Mason, III, USA	Education Program Coordinator
LTC H. F. Stolz, VC, USA	Chairman, Behavioral Sciences Department

## WELCOME

Darrell W. McIndoe, Colonel, USAF, MC, Director, Armed Forces Radiobiology Research Institute opened the 26th Meeting of the AFRRRI Board of Governors' at 0900 hours, 22 November 1977. He welcomed the Director, Defense Nuclear Agency and each of the Surgeons General of the Uniformed Services and made special comments about the presence of Dr. J.P. Sanford, Dean of the Medical School of the Uniformed Services University of the Health Sciences and the Deputy Director, Science and Technology, DNA, Mr. Peter H. Haas. Vice Admiral Monroe was requested to make the opening remarks.

Vice Admiral Monroe expressed his deep appreciation to the Surgeons General and to Dean Sanford for their taking time from their busy schedules to concern themselves with the AFRRRI mission. He made several comments concerning his total belief in the importance of the AFRRRI mission in support of the Department of Defense (DOD) and the safety and well-being of the United States. He made reference to the fact that AFRRRI data input into casualty criteria expectations had impacted on Army doctrines and weapons design. He pledged himself to be responsive to the needs and requirements of the Surgeons General and then turned the meeting over to the Director, AFRRRI.

### AFRRRI HISTORY:

Colonel McIndoe gave a short resume of the history of AFRRRI. The salient features of this resume are as follows:

AFRRRI was conceived in the mid-1950s as a radiation research resource of the United States Navy. However, because of its broad implications for supporting other DOD missions as well as being a significant asset for other medical institutions in the community (NIH), it was felt that it would be best funded and developed as a joint venture of all services and the Defense Atomic Support Agency was therefore requested to fund and manage this project with administrative direction being handled by the National Naval Medical Center. The original estimated cost was \$3.99 million. Groundbreaking occurred on 29 November 1960. Beneficial occupancy took place on 8 January 1962 with the reactor being first utilized in August 1962. Construction was completed on 19 September 1962. The total construction cost being \$4.95 million. Attachment 1 shows the time phasing of the construction effort at AFRRRI through Phase IV. Numerous slides were utilized to show the development of the construction effort with geographical locations and the nature and placement of the radiation sources. Highlights of the Minutes of the 22nd through 25th Meetings of the Board of Governors' were reviewed.

## AFRRI PROGRAM STATUS:

### Organizational Structure:

Attachment 2 shows the present organizational structure of the various AFRRI scientific departments and support services.

### Manpower:

Attachment 3 summarizes AFRRI authorized manpower from fiscal year 1974 through 1978 and the 1979-80 projections. Note should be made of the fairly high percentage of temporary help to support and accomplish the AFRRI mission. The point was raised with the Surgeons General about the present 11 percent vacancies in military staffing. Their assistance was requested in keeping these military slots filled to the best of the Services' ability.

### Budget:

The funding for the AFRRI mission is accomplished by DNA Headquarters and is categorized under Deputy Director, Science and Technology (DDST) as Project M (Medical). Project M is further broken down into a number of tasks, subtasks and work units. The tasks are divided into four separate areas, i.e., 1. Nuclear Weapons Effects Medical Planning, 2. Ionizing Radiation Effects, 3. Other Nuclear Weapons Effects on Biological Systems and 4. Radionuclide Production. At present only the first three tasks are active. Attachment 4 shows a projected summary for these tasks over the next five fiscal years. Attachment 5 shows AFRRI funding from Headquarters, DNA from FY 73-79. AFRRI has reimbursable funding authority and the addition of these funds are also depicted. Note that the high relative percentage of reimbursable funding occurred in FY76. The next attachment (Attachment 6) shows a breakdown of the source of reimburseable funding for FY74-78. The next attachment shows the distribution of funds for FY77 and then FY78. The significance here is the increase in funds for equipment. The next attachment shows AFRRI's use of funds when divided into support and research. Note the significant increase in actual research dollars between FY76 and FY77. Future funding requirements will be heavily dependent upon the acquisition of a new animal research facility and the development of a new ionizing radiation source, a 30 MeV cyclotron.

### Military Construction:

The 1965 AFRRI Master Plan showed the need for a 16,000 square foot animal research facility. The first cost estimates on a 24,000 square foot facility was made in FY74 and was priced at \$1.5 million. Plans were then developed to assess the actual needs for animal research space and an estimate of 36,000 square feet was rendered. In FY74

this cost estimate was \$3 million. FY76 Military Construction was requested of Congress for the establishment of an animal research facility, 36,000 square feet, at an estimated cost of \$6.1 million. FY77 showed an A&E design that could accomplish the same requirements in 32,000 square feet of space for \$5.6 million. At present, it is in the Armed Forces Military Construction Budget, a request for 32,000 square foot animal research facility with the anticipated price tag of \$6.3 million. Minor Military Construction has been going on over the last several years. At present, there is considerable upgrading of the physical security of the facility. There is a projected Minor MilCon requirement for better utilization of existing laboratory space, transferring it from administrative functions to laboratory research functions. Administrative space which is available for conversion is approximately 8,000 square feet and under present architectural engineering design estimates, this space could be replaced at a cost of \$40 per square foot for \$320,000 as opposed to the price tag of replacing laboratory space at approximately \$90 per square foot. This requirement has low priority at present, until the Major Military Construction effort has been successfully funded.

#### Affiliations:

Attachment 8 is a summary of various AFRRRI Staff academic affiliations and professional society membership, consultantship, advisory positions, etc. AFRRRI is active in the scientific community. Our interactions are international. Considering the size of the research staff at this facility, its worldwide impact is impressive.

Colonel McIndoe then advised, at approximately 1020 hours, that a short break would be made before discussing the AFRRRI mission and future efforts. At this point, LtGen Schafer, U.S. Air Force Surgeon General, advised the Board that he had a critical meeting to attend and must leave. He apologized for his departure and thanked the AFRRRI staff for their presentation. He informed VADM Monroe that he was supportive of the AFRRRI mission. He was particularly pleased to see that there had been a reduction in reimbursable funding effort which were not in total consistency with the AFRRRI ionizing radiation research mission. He advised VADM Monroe that he was knowledgeable of AFRRRI's efforts and endorsed the present efforts and future expectations.

The 26th AFRRRI Board of Governors' meeting reconvened at approximately 1045 hours. Colonel McIndoe resumed his briefing.

#### AFRRRI RESEARCH MISSION:

Numerous illustrative audiovisual aids were utilized during this portion of the briefing. No attempt is made here to reproduce these slides or TV tapes. A summary of this briefing is as follows:

The AFRRRI in-house radiobiology research mission has been divided into four subtasks. First subtask is casualty criteria, second is combined injury, third is collateral damage and the fourth is diagnosis and therapy of radiation injury. Considerable effort has been expended in all areas; results obtained which suggest significant clues in the better understanding of radiation injury. In the area of casualty criteria, it has been found that the subhuman primate undergoes a period of transient incapacitation after whole body irradiation in excess of 1500 R while doing simple chaired tasks of a non-stress nature or non-physically demanding tasks. However, it has been found that by reducing the allowable response time on the behalf of the animal in carrying out his assigned tasks, thus causing significant speed stress, transient incapacitation has occurred as low as 800 R. This is a major finding. Other important research efforts in the area of casualty production show significant effort into the evaluation of the effects of histamine on smooth muscle, one of the suspected mediators of the transient incapacitation phenomenon. A significant finding has been obtained in the results of simple nervous system enzyme activity, i.e., monoamine oxidase, which occurs between 18,000/8,000 roentgens midline dose, depending upon whether it is gamma or neutron radiation. This divergence of induction and reduction in enzyme activity would suggest a biological indicator potential between gamma and neutron injury. The utilization of the Ommaya reservoir to obtain spinal fluid for evaluation in awake intact animals was demonstrated. Further evaluation of the difference between gamma and neutron tissue radiation effects was demonstrated showing the significant RBE difference in lung tissue as well as the unique finding of a significant difference in perfusion characteristics at significantly different doses and a more intriguing finding of delayed ventilation characteristics showing significant residual airway impairment following neutron therapy. Data was presented to show the significance of combined injury in wound healing when related to gamma radiation. Normally non-lethal doses of radiation associated with a very small wound anywhere within the first 2-3 days of injury increase a non-mortal situation to an LD<sub>50</sub>. In the area of collateral damage, various efforts in analyzing serum reactive glycoproteins relating this to some of the other commercial evaluations of serum glycoproteins were illustrative of a measurement of radiation injury. The effects of low-level ionizing radiation on gallium binding to transferrin were demonstrated. In the area of diagnosis and therapy, results of protections from endotoxin by divalent cations was presented. The finding that platelet aggregation affords protection from endotoxin as well as radiation injury and that those things which could enhance platelet aggregation were radioprotective. Results of granulocyte preservation were shown and that the technique of differential density gradient elutriation of granulocytes is a viable and practical means for separation and preservation of these important cellular elements.

During the 24th annual meeting of the AFRRRI Board of Governors' the Surgeons General requested AFRRRI to develop educational program in radiobiological effects of nuclear weapons for their medical departments and other staff officers. The first syllabus of this program was presented at the 25th Board of Governors' meeting. Today, I am happy to report that the educational program has developed to a separate task under Project M. We have a full time education program coordinator in the Directorate. The education program has been divided into an intermural phase, involving our own employee training, both job-related and supervisory training as well as assisting in training scientific personnel in computer applications. The extramural program has been predominantly the Nuclear Weapons Effects Program. Short courses have been given to the Military Academy at West Point, the Freshmen Class in the Medical School at USUHS, to the Nuclear Medicine Course at the National Naval Medical Center and to the Walter Reed Medical Center. This next year AFRRRI will sponsor a 40 hour curriculum in the Fall and late Winter. Travel and per diem will be paid to 10 medical officers from each service. The course will be given in conjunction with the Nuclear Medicine Course sponsored by HSETC at NNNMC. We will continue to give a 14 hour lecture series to the freshman medical class and may expand into further classwork in the sophomore year. Attached is a copy of the planned class schedule for the nuclear medicine students at NNNMC and the freshman class at the Medical School at USUHS. Also attached is a summary of lecture topics which we feel are applicable for this training program.

Over the past three years, the AFRRRI research program has been redirected into a more radiation effects orientation. The program was presented to Mr. Haas in February 1976, at which time a three-year program for facility upgrading was presented. Approval was granted to embark on this program and increased direct funding has resulted in a significant increase in research hardware at the Institute. Upgrading in the computer facilities, acquisition of sophisticated instrumentation to increase precision and sensitivity have enabled us to broaden our research program with minimal increased requirement in manpower. The future should be an exciting time at AFRRRI. The ability to follow physiologic events with short acting radionuclide tracers is now at hand. Physiologic elements, carbon, oxygen and nitrogen can be measured accurately and imaged for their anatomical location with fair precision. We feel these techniques are essential for the further elucidation of the mechanisms of radiation injury. Therefore, it is our tentative plan at this time to acquire a small medical cyclotron to produce these short acting radionuclides and to acquire the sophisticated imaging apparatus. We feel the cyclotron would be of immense value as a resource to the entire medical community in the Bethesda area.



Hopefully, the new animal research facility will be available at the time of the completion of this AFRRRI resource upgrade. The marriage of increased space and increased capability should allow for increased research efforts in the 100-1,000 rad exposure range and to further elucidate the relative roles of neutrons and gamma photons in the pathogenesis of radiation injury.

As you are well aware, the Defense Nuclear Agency has been given the responsibility for the management of a joint task force to cleanup the Enewetak Atoll. This past summer, VADM Monroe felt the need for a safety and audit team to visit the Atoll to make absolutely certain that all safety precautions were being taken for our personnel. The previous Director, AFRRRI was requested to support this effort and he, in turn, directed the Deputy Director to assemble a team and visit the island quarterly. The first trip was made in early August and we completed the second visit earlier this month.

Colonel McIndoe then stated that his briefing to the Board was completed and asked for comments.

Dr. Sanford expressed his appreciation for inviting him to the Board of Governors' meeting. He advised VADM Monroe that he was quite impressed with the AFRRRI research program and was also very appreciative of the utilization of AFRRRI space for some of his staff. He felt the relationship between AFRRRI and USUHS was mutually beneficial. He then stressed the importance of acquiring a medical cyclotron and the ability to study pulmonary infectious disease with radioactive nitrogen. He felt that this acquisition would be a significant asset for all medical investigations within this community and strongly endorsed the program as outlined.

LTG Pixley also stated his appreciation for the presentation and admitted that he was not knowledgeable in the mission of AFRRRI but readily recognized its importance as a DOD resource and was pleased to hear of our efforts in the nuclear weapons effects educational area. VADM Arentzen echoed LTG Pixley's appreciation for the program. He also strongly endorsed the educational effort that AFRRRI was embarking on.

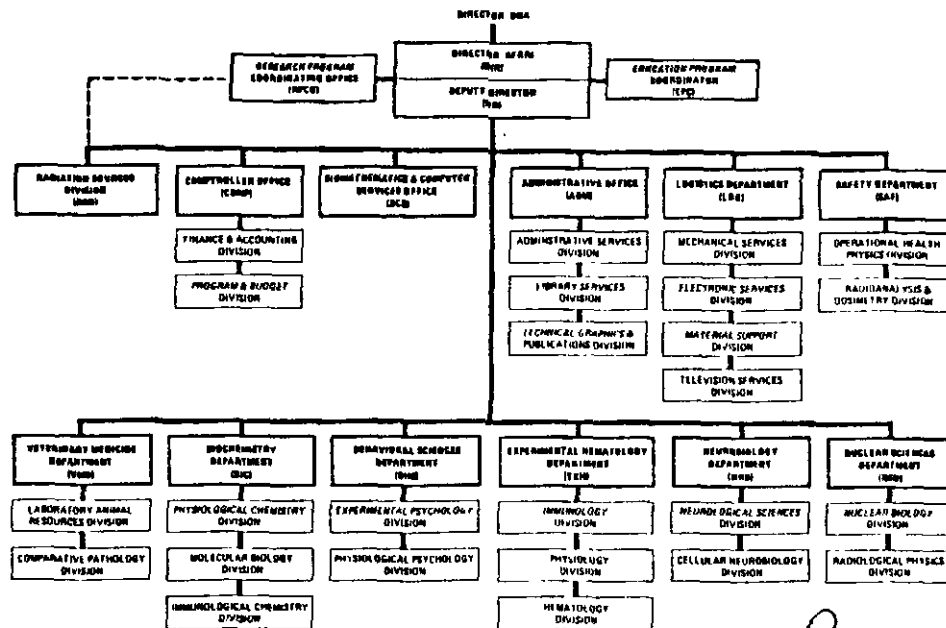
Mr. Haas reiterated the significance of the change in AFRRRI effort towards more mission responsiveness; that AFRRRI would be responsive to the requirements of the Services and have his full support.

VADM Monroe thanked the Board and guests for their attendance; expressed his appreciation to the Director, AFRRRI for an informative briefing and concluded the meeting at approximately 1140 hours.

CONSTRUCTION PHASE	FACILITY	CONSTRUCTION CONTRACT AWARD	GROUND BREAKING	COMPLETION	AREA S.F.	COST
I	LABORATORY AND REACTOR BUILDING	29 Nov 1960	Nov 1960	2 Jan 1962	40,828	\$ 3,240,000
II	LABORATORY AND ANIMAL FACILITY	24 Sept 1963	8 Oct 1963	13 Jul 1965	26,090	\$ 1,163,000
III	POSITIVE ION ACC. (P.I.A.) BUILDING	14 Sept 1965	1 Oct 1965	15 Dec 1967	17,485	\$ 1,200,000
IV	LABORATORY AND TECH. SUPPORT BUILDING	4 Apr 1968	20 Apr 1968	28 Jan 1970	35,815	\$ 1,890,000

ATTACHMENT 1

# AFRI ORGANIZATION



1 OCTOBER 1977

*Danell W. McIndoe*  
 DANIEL W. MCINDOE  
 Colonel, USAF, MC  
 University

ATTACHMENT 2

**AFRRI AUTHORIZED MANPOWER BY FISCAL YEAR**

	<i>74</i>	<i>75</i>	<i>76</i>	<i>77</i>	<i>78</i>	<i>79/80</i>
<b>MILITARY</b>						
OFFICER	57	52	52	52	52	52
ENLISTED	40	36	35	35	35	35
<b>TOTAL</b>	<b>97</b>	<b>87</b>	<b>87</b>	<b>87</b>	<b>87</b>	<b>87</b>
<b>CIVILIAN</b>						
PERMANENT	139	135	137	132	129	129
<b>TOTAL JTD AUTH</b>	<b>236</b>	<b>222</b>	<b>224</b>	<b>219</b>	<b>216</b>	<b>216</b>
TEMPORARY	16	12	6	27	10	?
<b>TOTAL O/H</b>	<b>252</b>	<b>234</b>	<b>230</b>	<b>246</b>	<b>226</b>	<b>?</b>

ATTACHMENT 3

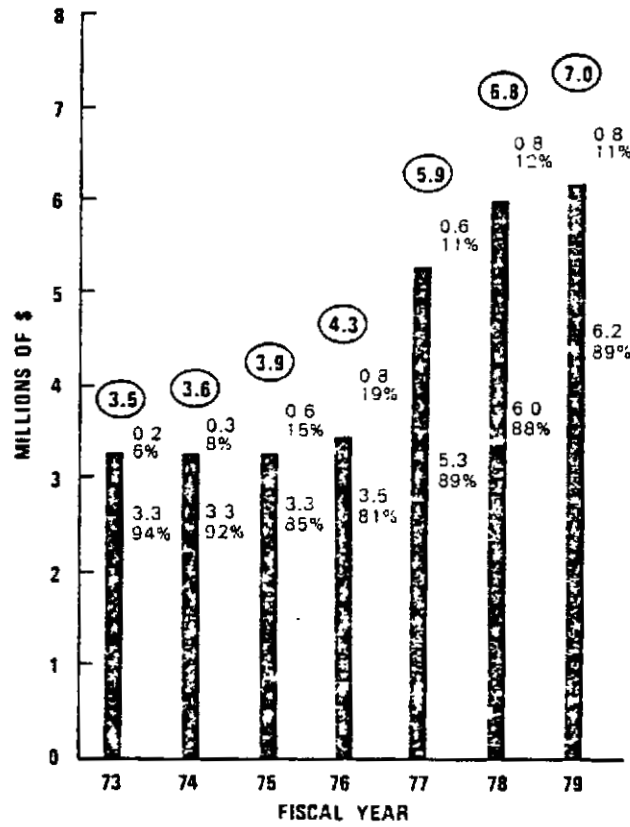
**PROJECTED AFRRF FUNDING ROMTS BY TASK**  
(THOUSANDS OF \$)

TASK		FY76	FY80	FY81	FY82	FY83
NWE MEDICAL PLANNING	I	\$ 80	\$ 80	\$ 80	\$ 80	\$ 80
IONIZING RADIATION EFFECTS	J	6,775	7,952*	8,747	9,622	10,584
OTHER NWE ON BIOLOGICAL SYSTEMS	K	125	150	150	150	150
SUB TOTAL		\$ 6,980	\$ 8,082	\$ 8,977	\$ 9,852	\$ 10,814
RADIONUCLIDE PRODUCTION	L	750	750	750	300	300
TOTAL FUNDING		\$ 7,730	\$ 8,832	\$ 9,727	\$ 10,152	\$ 11,114

\* INCLUDES \$ 500,000 TO MAINTAIN ANIMAL FACILITY FROM FY80 FWD

ATTACHMENT 4

AFRRI FUNDING FY 73 - FY 79



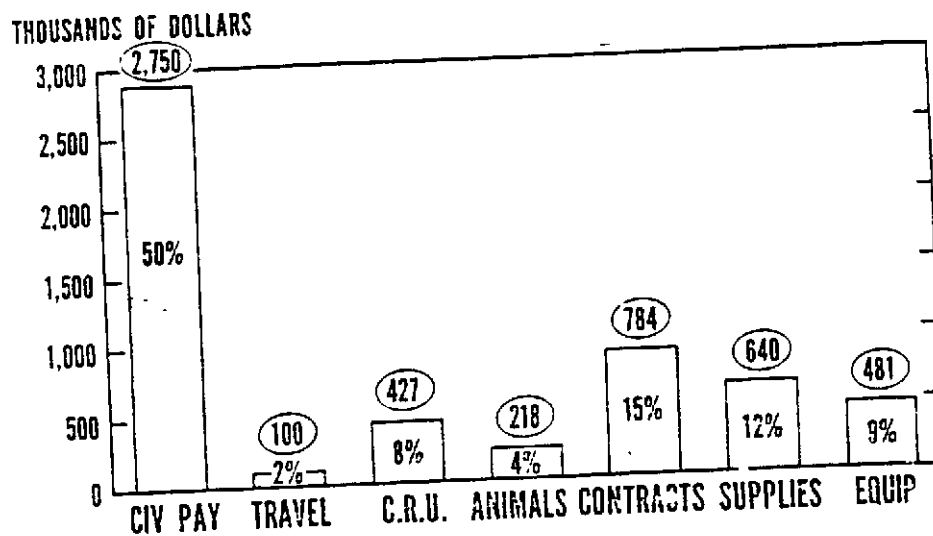
ATTACHMENT 5

**SOURCE OF REIMBURSEMENTS BY FISCAL YEAR**  
(MILLIONS OF \$)

	74	75	76	77	78
USN	\$ .118	\$ .317	\$ .429	\$ .454	\$ .375
USA	.125	.001	.045	.061	.075
USAF	.022	.008	.005	.012	.060
NIH	.034	.136	.115	.035	.090
DGT	-	.077	.175	-	.140
OTHER	.013	.016	.040	.060	.060
<b>TOTAL</b>	<b>\$ .312</b>	<b>\$ .555</b>	<b>\$ .809</b>	<b>\$ .622</b>	<b>\$ .800</b>

ATTACHMENT 6

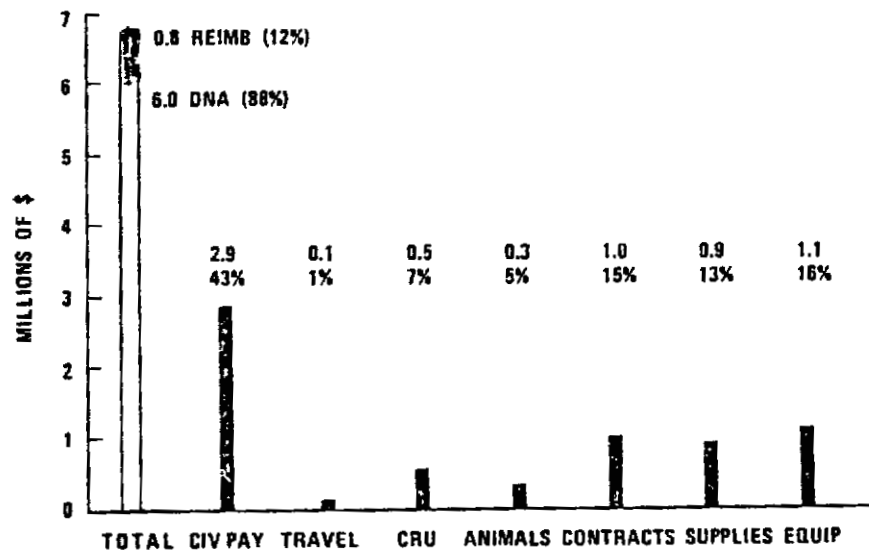
# FY77 FUND DISTRIBUTION (OBJECT CLASS)



ATTACHMENT 7a



FY 78 FUND DISTRIBUTION (OBJECT CLASS)



ATTACHMENT 7b

## AFRRI STAFF PROFESSIONAL INTERACTIONS

### I. ACADEMIC

#### A. Visiting or Adjunct Professor

1. George Washington University School of Medicine
2. Howard Community College - Department of Nursing
3. Johns Hopkins - Nuclear Medicine Department
4. Uniformed Services University of the Health Sciences - School of Medicine
5. American University - Department of Biology
6. University of Nairobi - Department of Biochemistry
7. Georgetown University - Department of Neurology

In addition, numerous lectures are presented at various military courses such as Medical Lab Technicians Program and Frozen Blood Program at NNMC, others at WRAIR, American Institute of Biological Sciences, etc.

#### B. Thesis - Graduate Student Program Advisors

1. George Washington University School of Medicine
2. American University - Department of Biology
3. University of Nairobi, Kenya - Department of Biochemistry
4. University of Virginia - Department of Psychology

#### C. Guest Lectures Presented Recently

1. University of Miami
2. SUNY, Albany
3. Emory University, Atlanta
4. Yerevan, Armenia, USSR
5. Monaco; Cambridge, England
6. Howard Medical School
7. Germany; France

ATTACHMENT 8

## II. SOCIETIES, CONSULTANTSHIPS, ADVISORY POSITIONS

### A. Memberships, Professional Societies

The Staff hold membership in a broad variety of professional organizations including the American Medical Association, American Veterinary Medical Association, Health Physics Society, American Association of Physicists in Medicine, American Industrial Hygiene Association, American Association for the Advancement of Science, American Physiological Society, Radiation Research Society and many others.

### B. Elected Positions, Professional Societies

<u>Society</u>	<u>Capacity</u>
American Board of Health Physicists	Chairman, Continuing Education Panel
American Physiological Society	Chairman, Neurophysiology Steering Committee Member, Program Advisory Committee
International Society of Experimental Hematology	Chairman, Annual Meeting Editor, Annual Meeting Proceedings
Brain Research	Member, Organizing Committee, Winter Meeting
Air Force Psychology News	Associate Editor

### C. Reviewers, Journal Articles and Proposals

Referee	Science Nature Brain Research Journal of Neurophysiology Biophysical Journal Journal of General Physiology Radiation Research Experimental Hematology Proceedings of the Society of Experimental Biology and Medicine
Evaluator of Grants	National Science Foundation

#### D. Consultant and Advisory Capacities

<u>Entity</u>	<u>Function</u>
NIH - Mental Health	Board of Governors
American Association for Accreditation of Laboratory Animal Care	Site Reviewer and Inspection Team
University of Washington	Professional Appointments
University of Buffalo	Professional Appointments
Johns Hopkins Hospital	Nuclear Medicine
Department of Transportation	Head Injury Study Group
Georgetown University	Professional Appointments
NNMC	Hematology, Nuclear Medicine, Endocrinology
Surgeon General, USAF	Internal Medicine, Endocrinology, Nuclear Medicine
Uniformed Services University of the Health Sciences	Laboratory Animal Medicine
Naval Blood Research Laboratory	Frozen Blood Program
NIH-NCI	Head and Neck Cancer Advisory Group

#### III. COLLABORATIVE RESEARCH EFFORTS

Practically every principal investigator interacts with one or more civilian or military institutions in the conduct of mutually interesting research projects. Examples of institutes where collaborative arrangements exist are:

Nuclear Medicine	Johns Hopkins NIH George Washington University NMRI NNMC
Neurobiology	George Washington University Corporation of the Bermuda Biological Station Department of Transportation WRAIR NIH

Experimental Hematology	NIH NMRI Georgetown University Navy Toxicology Unit
Behavioral Sciences	Johns Hopkins National Institute of Alcohol Abuse and Alcoholism NIMH NMRDC Navy Toxicology Unit Georgetown University George Washington University University of Maryland WRAIR
Biochemistry	NIH-NCI NNMC NMRI USDA NYU University of Pavia, Italy Georgetown University University of Kansas University of Alabama

IV. The Staff participates in a number of DOD related matters in official capacities. Examples in this category are:

DOD representative to the Environmental Protection Agency, Interagency Liaison Committee for Developing Guidance on Plutonium Soil Contaminated Standards.

DOD representative to the EPA Interagency Liaison Committee on Occupational Radiation Exposure Standards.

Collateral Damage Issues and Combined Injury for NATO

Consultant to Panel Members of NATO for radiation effects.

Initiating Educational Series for various service groups on radiation effects.

Defense Nuclear Agency designated Occupational Safety and Health Official.